

CLAIMS

What is claimed is:

1. A reactor, comprising:
at least a first electrode disposed in a liquid volume;
at least a second electrode disposed in a gaseous volume above said liquid volume;
at least one central electrode disposed between said first and said second electrode, said gaseous volume having an interface with said liquid volume; and
at least one power supply connected to said electrodes for generating an electrical discharge between said first and central electrodes and an electrical discharge between said central and second electrodes.
2. The reactor of claim 1, wherein said central electrode is disposed at or near an interface between said gaseous and said liquid volume.
3. The reactor of claim 1, wherein at least one of said electrical discharges comprises pulsed electrical discharges.
4. The reactor of claim 1, wherein chemically reactive liquid phase species generated by said reactor comprise at least one of hydrogen peroxide, hydrogen, and hydroxyl radicals.

5. The reactor of claim 1, wherein chemically reactive gas phase species generated by said reactor comprise at least one of ozone, oxygen radicals, hydroxyl radicals, and gaseous ions.

6. The reactor of claim 1, wherein said liquid or gaseous volume includes at least one catalyst.

7. The reactor of claim 6, wherein said catalyst includes zeolite, wherein said zeolite is disposed in at least one of said liquid volume and said gaseous volume.

8. The reactor of claim 6, wherein said catalyst includes at least one photocatalyst.

9. The reactor of claim 6, wherein said catalyst includes at least one platinum catalyst.

10. A reactor, comprising:
at least a first electrode disposed in a liquid volume;
at least a second electrode disposed in a gaseous volume, said gaseous volume having an interface with said liquid volume; and
at least one power supply connected to said first and second electrodes for generating a high voltage electrical discharges between said first and second electrodes, wherein a zeolite comprising catalyst is included in at least one of said liquid volume and said gaseous volume.

11. The reactor of claim 10, wherein at least one of said electrical discharge comprises pulsed electrical discharges.

12. The reactor of claim 10, wherein chemically reactive liquid phase species generated by said reactor comprise at least one of hydrogen peroxide, hydrogen, and hydroxyl radicals.

13. The reactor of claim 10, wherein chemically reactive gas phase species generated by said reactor comprise at least one of ozone, oxygen radicals, hydroxyl radicals, and gaseous ions.

14. The reactor of claim 10, wherein said liquid volume or gaseous volume includes a non-zeolite catalyst.

15. The catalysts of claim 14, wherein said non-zeolite catalyst includes at least one photocatalyst.

16. A method for the destruction of contaminants, comprising the steps of:
generating a first high voltage electrical discharge across at least a portion of a gaseous volume for the generation of at least one chemically reactive gaseous species;
generating a second high voltage electrical discharge across at least a portion of a liquid volume for the generation of at least one chemically reactive liquid phase species, said gaseous volume having an interface with said liquid volume, wherein contaminants in said gaseous

volume or said liquid volume are degraded by action of at least one of said chemically reactive gaseous species and said chemically reactive liquid species.

17. The method of claim 16, wherein at least one of said high voltage electrical discharge comprises pulsed electrical discharges.

18. The method of claim 16, wherein said chemically reactive liquid phase species generated by said reactor comprise at least one of hydrogen peroxide, hydrogen, and hydroxyl radicals.

19. The method of claim 16, wherein said chemically reactive gas phase species generated by said reactor comprise at least one of ozone, oxygen radicals, hydroxyl radicals, and gaseous ions.

20. The method of claim 16, wherein said liquid or gaseous volume includes at least one catalyst.

21. The method of claim 20, wherein said catalyst includes at least one zeolite.

22. The method of claim 20, wherein said catalyst includes at least one photocatalyst.

23. The method of claim 20, wherein said catalyst includes at least one platinum comprising catalyst.